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Flow-injection and sequential injection determination of hydroxypurines on an electrode modified with mixed-valence ruthenium and iridium oxides

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Abstract

Mixed-valence ruthenium (RuO x) and iridium (IrO x) oxides and composites on their basis (RuO x -IrO x or IrO x -RuO x) electrodeposited onto the surface of a glassy carbon electrode exhibit a catalytic activity in the electrooxidation of uric acid, xanthine, and hypoxanthine. The transition from metal oxides to composites of two mixed-valence metal oxides leads to an increase in the catalytic effect of the oxidation of hydroxypurines. The IrO x -RuO x composite demonstrated the highest catalytic activity. Procedures for the amperometric detection of hydroxypurines on this composite electrode under the conditions of flow-injection analysis (FIA) and sequential injection analysis are proposed. A linear dependence of an analytical signal on the analyte concentration is observed in the range 1 × 10-6 to 5 × 10-3 M for uric acid and xanthine and 5 × 10-7 to 5 × 10-3 M for hypoxanthine under FIA conditions and from 5 × 10-7 to 5 × 10-3 M for uric acid and xanthine and 5 × 10-9 to 5 × 10-3 M for hypoxanthine in sequential injection analysis. Under FIA conditions, the sensitivity, rapidity, and performance of the analysis increase compared to the stationary conditions. The advantages of sequential injection analysis over FIA include a lower consumption of the supporting electrolyte; the absence of pumps and connections; and an increase in sensitivity, reproducibility, and rapidity.

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Keywords

chemically modified electrodes, electrooxidation of hydroxypurines, flow injection analysis, mixed-valence ruthenium and iridium oxides, sequential injection analysis